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ABSTRACT

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THEORY AND DATA: THEORY CONSTRUCTION USING LINEAR STRUCTURAL MODELS IN FAMILY RESEARCH

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ABSTRACT

Family research has been hindered by a reliance on either empirical relationships or abstract theoretical claims. There has been no effective way to bridge the gap between statistical relationships and theoretical propositions. The application of linear structural equation models helps to bridge this gap. We do not develop empirical propositions. Rather, we use the statistical relationships between imperfectly measured variables to estimate the true effects between theoretical propositions. In this sense we bring together our theory and our method. This approach to theory construction allows for surplus meaning in our theoretical constructs and emphasizes systemic meaning for these concepts. The approach is especially valuable for subjective orientations such as symbolic interaction.

THEORY AND DATA: THEORY CONSTRUCTION USING LINEAR STRUCTURAL MODELS IN FAMILY RESEARCH

Enormous efforts have been expended to orient family research toward a more systematic approach to theory construction. Few social science disciplines have devoted as much effort to improve the state of theory construction over the last twenty years. Christensen (1964) characterized the *major task* of family research since the 1950s as systematic theory building. The decade in review editions of *The Journal of Marriage and the Family* published in 1971 and again in 1981 attest to this growing interest as do the two volumes of *Contemporary Theories About the Family* (Burr, et al., 1979b).

Developments in econometrics and psychometrics during the 1970s offer family theorists an enormous opportunity to formalize theory construction and explicate the relationship between our theory and data. This is made possible by advances in the analysis of linear structural equations, LISREL (Joreskog and Sorbom, 1981; Bagozzi, 1980; Acock, 1979). While the advances will be explicated in what follows, the pivotal development is the distinction between the measurement model and the theoretical model along with the simultaneous specification of their relationship in an integrated framework. As recently as 1979, the leading family specialists in theory construction wrote:

> Path models and many other statistical techniques are valuable in making inferences about the truth or falsity of theoretical ideas, but they are not the ideas themselves. Thus the point

> being made here is that path models, and other statistical calculations or diagrams for that matter are not theory because they consist of hypothetical, abstract ideas about the effects of variation of variables on other variables. (Editors, Burr, et al., 1979b:22)

In sharp contrast to this view the approach presented in this paper allows the inclusion of the theoretical model and the measurement model in a single framework. It is possible to state our theory at one level and, in the same model, derive *ESTIMATES* of the true relationships between the true theoretical concepts. This integration of theoretical and empirical models has considerable potential for future theory construction work in the family area. It merges the inductive emphasis of contemporary family theorists with a deductive orientation. It enhances the isomorphism between our theory and research. Moreover, it is far more compatible than conventional statistical procedures with subjective orientations such as symbolic interaction which emphasize indeterminancy.

The Meaning of Theory and Theoretical Constructs

Goode indicates that family theory involves "the systematic interrelations among empirical propositions (1959:186)." This is partially correct.[1] It follows from the influence of logical positivism on social research. This focus of positivism on empirical relationships among empirical variables has greatly limited the development of theory construction. Bridgman, one of the strongest proponents of positivism and operationalism, is described by Kaplan (1964) as advocating that the operational definition of a variable is all that is needed to understand its full scientific meaning. Such extreme positivism makes it difficult for

family researchers to utilize general social science theoretical concepts or to contribute to elaboration of these concepts. If a family researcher shows that a lack of role clarity for the wife-mother results in her having low satisfaction using particular scales, then we could not generalize beyond these specific scales. That is because, for the extreme positivist, role clarity and satisfaction have no meaning beyond these particular scales.

A far more pragmatic approach to theory and data is known as the *REALIST* model (Bagozzi, 1980). *Theoretical Constructs* are developed that are not explicitly defined. They have an enormous surplus meaning that extends beyond their operational measurement in any particular study. The definition of these theoretical constructs is implicit in their relationships to one another and in their empirical indicators. There are numerous examples of such theoretical constructs in social science:

> What Marx meant by "class" or by "capitalism" is made manifest only in the whole corpus of his writing, as is Freud's meaning of "libido," or Durkheim's of "anomie." Notice that a term may have systemic meaning even though it is apparently explicitly defined somewhere. . . . The chances are, indeed, that a key term of this kind is "defined" several times and in several different ways. The diversity does not necessarily mark a lapse either of logic or of memory, but the occurrence, rather, of systemic meaning (Kaplan, 1964:64).

Surplus meaning does not mean sloppiness. The surplus of meaning is with respect to any particular definition or measurement. Surplus exists in the fact that the meaning of theoretical concepts is *systemic*. As these theoretical concepts are defined and measured, they lose their surplus meaning.

This desire to develop theoretically rich terms which have surplus meaning is recognized by family researchers. Burr, et al. (1979b) point to the need to use general concepts. Family theory will be most successful if it is translatable to more general, social science theory. "Family scholarship would be integrated with the mainstream of sociology and social psychology to enrich both domains (p. xii)." More specifically, the extensive efforts of Nye to incorporate exchange theory into family research using such theoretical constructs as "cost," "reward," or "profit" is rich with examples of what might be a cost or reward, but the meaning of these constructs is always more general than the content of any particular empirical indicator or combination of indicators.

We propose to revise Goode's definition of family theory. We include this notion that theory consists of sets of related propositions, but see these as linking theoretical constructs rather than empirical variables. The role of theory construction is to bridge the gap between empirical constructs with their statistical relationships, on the one hand, and theoretical constructs involving theoretical propositions, on the other hand. We reject the positivist position that limits the meaning of theoretical constructs and insist that such constructs have a systemic meaning that gains vitality from surplus meaning. This surplus meaning should not be confused as sloppiness. The surplus meaning comes from the variety of applications of the theoretical constructs across a range of substantive research.

Three Levels of Concepts

It is possible to develop any number of levels of concepts varying from the directly observed measurements to the most abstract theoretical constructs. It is reasonable to focus on three levels of concepts. Following Bagozzi (1980) and Feigl (1970), we label these *THEORETICAL CONSTRUCTS*, *DEFINED CONCEPTS*, and *EMPIRICAL CONCEPTS*. Their relationships are illustrated in Figure 1. Note the direction of the arrows between the levels is downward. This reflects the emphasis on deductive reasoning in the application of social science theory to family research. Of course, there is room for inductive processes to revise or revolutionize the general theory.

--Figure 1 about here--

This simple example has two Theoretical Constructs with two Defined Concepts that are logically derived from them. The causal relationship between the two theoretical constructs is the same as the relationship between the two defined concepts. The first defined concept has three empirical concepts (measured variables in the rectangles) that serve as *indicators*, while the second defined concept has two empirical concepts serving as indicators. All that is actually observed are the empirical indicators. The statistical relationships between these empirical variables are not propositions, they are simply correlations (or covariances). Most past work has treated these correlations as if they were propositions rather than recognizing that they are only the basis for inferences about the causal relationships, i. e., propositions linking the defined concepts or the theoretical constructs. We will reserve the term *proposition* for relationships between either defined concepts or theoretical constructs.

In Figure 1, the theoretical concepts are defined by their causal relationship, and their epistemic relationships to the defined concepts and empirical concepts. These theoretical terms have a maximum of surplus meaning and are general to all social science. They are inherently unobservable.

The defined concepts are somewhat less general being tied to a particular substantive area such as the family. Efforts to define them limits there connotative richness, but their primary meaning is in their relationships to one another and in the espistemic loadings of the empirical variables. While they are more specific than the theoretical constructs, they are still much more general than the particular empirical variables measured in a particular sample in a particular study. Like theoretical constructs, these defined concepts are inherently unobservable. As family researchers, we are primarily interested in theory at the level of defined concepts, that is, sets of interrelated propositions linking defined concepts. However, these theories are linked to the more general theories of social sciences which are sets of interrelated propositions linking theoretical constructs.

Figure 1 may be better understood with a substantive example. This example is for heuristic purposes to aid in understanding the three levels of concepts. Figure 2 presents this example.

--Figure 2 about here--

In this example, Attitude, a theoretical construct, is seen as the cause of Behavior, another theoretical construct. Notice, that these theoretical constructs are extremely abstract. The fact that the vast literature attempting to define attitudes and behavior (Schuman and

Johnson, 1976) includes conflicting definitions is not a problem. As Kaplan (1964:64) indicates, the meaning of such theoretical constructs is in the whole corpus of research and reflects systemic meaning. Feminist Attitude of Men and Equalitarian Sex Role Behavior of Men are defined concepts. As defined concepts, some of the surplus meaning is removed by explicit attempts to define these concepts, as well as the empirical indicators used in their operationalization. Feminist Attitude of Men is linked to three empirical concepts which we have labeled Scale 1, Scale 2, and Self-Report. Egalitarian Sex Role Behavior of Men has two indicators, namely, signing a petition for ERA and the percentage of household chores performed by the man.

The specific empirical indicators used in this example are somewhat less critical to this approach to theory construction than they are to a positivist perspective. Different studies dealing with the Feminist Attitudes of Men may vary in the particular indicators used and in the number of indicators. The ultimate objective of theory construction is not the statistical relationship between empirical indicators, *per se*, but in using these statistical relationships as a basis for inferring the causal relationship between the higher level concepts.

Rules of Correspondence

Costner, writing in 1969 presented an early sociological effort to develop the systematic approach to theory construction being illustrated here. He saw the need to move away from the positivist restrictions on the meaning of theoretical constructs and to draw together the observed variables of our empirical indicators with the unobserved variables of our theoretical costructs. However, he points to the problem of linking the different levels of abstraction together:

> Although the litrature of the philosophy of science has provided us with terms for referring to the gap between abstract conceptions and concrete events-- *rules of correspondence, epistemic correlations, operational* definitions, and *indicators of abstract dimensions*-- these terms do little more than remind us that the gap is there. They do not provide clear guidelines for bridging the gap and suggest no criteria for determining the adequacy of the more or less arbitrarily devised connections between abstract and empirical levels (p. 299).

An appreciation for this problem can be obtained by consulting the philosophy of science literature which is rich in allegorical meaning for the rules of correspondence, but short on practical techniques. Hemple, one of the clearest of the writers on the subject, states:

> The whole system floats, as it were, above the plane of observation and is anchored to it by rules of interpretation. These might be viewed as strings, which are not part of the network but link certain points of the latter with specific places in the plane of observation. By virtue of those interpretive connections, the network can function as a scientific theory: From certain observational data, we may ascend, via an interpretive string, to some point in the theoretical network, hence proceed, via defintions and hypotheses, to other points, from which another interpretive string permits a descent to the plane of observations (1952:36).

Thus, we are told that the levels of concepts are linked by "rules of interpretation." Moreover, the allegory appears consistent with Figure 1. Unfortunately, the precise nature of these rules is left for our interpretation of the meaning of an "interpretive string." On the positive side, Costner contributed greatly to developing more useful rules of correspondence linking the levels of concepts and allowing us to make inferences about the true effects of theoretical concepts on the basis of specific statistical relationships observed among empirical concepts. Costner's rules are deductively derived and the present paper extends this deductive component of theory construction.

The importance of developing more tractable rules of correspondence is clearly stated in Costner's critique of both classical and positivist social science theory construction:

> The requirement that scientific theories include both abstract concepts and concrete implications, and that the two be logically connected, has been treated rather casually by sociologists. Traditionally, sociological theorists have focused on abstractions with loose or ill-defined implications about matters of fact. More recently, some sociological formulations have shifted to the opposite extreme, stating only connections between measures without any attempt to make more abstract claims. Either of these modes of theory construction is costly, sacrificing either the clarity of empirical implications or the integrating potential of abstract concepts (Costner, 1969:299).

We need two levels of linkages, or rules of correspondence. The first set of rules applies to linking the theoretical constructs to the defined

concepts. The second level involves moving from the defined concepts to the empirical concepts. The first linkage is the most ambiguous because we are trying to present rules for deriving the relationship between one set of unobserved variables and another set of unobserved variables. For this we have no empirical strategy and are left with a rational approach alone. We use the logical criteria of deduction following Zetterberg (1965).[2] For our heuristic example we need to reason that the feminist attitude of men is an instance of attitude, equalitarian sex role behavior of men is an instance of behavior, and that the relationship between the feminist attitude of men and the equalitarian sex role behavior of men is identical to the relationship between the larger classes of attitudes and behaviors from which they are derived. Needless to say, presenting such an argument is complex. There is considerable literature that suggests the direction of causality may be reversed. For our purposes, however, we say that the rules of correspondence require us to go through the literature and theoretical thought that is relevant and piece together a logical justification for our defined concepts and their relationships as being a subset of the relationship between attitudes and behaviors. Beyond such logical reasoning, we need to recognize the importance of concensus to the emergence of such construct validity. In some applications there may be competing rationales which are equally logical. The role of concensus may be greatest in such cases where the justification for the concensus is the weakest.

The rules linking the defined concepts with one another and with their various indicators involves linking unobserved variables with observed variables and is subject to formally derived empirical criteria. This

formalization is the basis for the analysis of linear structural models developed by Joreskog and Sorbom (1981). Since this is intended to be a paper on theory construction rather than statistics, we will attempt to present only an outline of the approach. However, even with this focused aim, there will be some necessary statistical analysis since that is the crux of the rules of correspondence.

The presentation of the rules of correspondence can be divided into two parts. First, the measurement model has certain information that allows us to assess the links between the defined and empirical concepts. Second, the structural model has information that, together with the measurement model, allows us to estimate the relationship between the defined concepts. These two models can be presented as two sets of structural equations. First, the structural equation is:

$$\eta_1 = \gamma\xi + \zeta \qquad 1.1$$

and, second, the measurement equations are:

$$X_1 = \lambda_1\xi + \delta_1 \qquad 2.1$$

$$X_2 = \lambda_2\xi + \delta_2 \qquad 2.2$$

$$X_3 = \lambda_3\xi + \delta_3 \qquad 2.3$$

$$Y_1 = \lambda_4\eta + \varepsilon_1 \qquad 2.4$$

$$Y_2 = \lambda_5\eta + \varepsilon_2 \qquad 2.5$$

Of course, there is only a single structural equation stating our theory. Remember that this is a heuristic example and normally you have several interrelated structural equations to express your theory under the

assumption that a theory consists of a set of interrelated theoretical propositions. There are twelve coefficients that need to be estimated (it may be useful to consult Figure 2 to interpret the Greek symbols for these coefficients): The GAMMA (γ) and ZETA (ζ) from the structural equation; the five LAMBDAS (λ), three DELTAS (δ), and two EPSILONS (ϵ) from the measurement equations.

The ETA (η) in Figure 2 symbolizes the endogenous defined concept, the KSI (ξ) symbolizes the exogenous defined concept, and the ZETA (ζ) represents the unexpained variance in the structural model. We want to estimate the value of the GAMMA (γ) which links the "true" sex role attitude (unobserved, exogenous defined concept) with the true sex role behavior (unobserved, endogenous defined concept).

The measurement model has five equations. Since there are multiple indicators of each defined concept, we have a loading (similar to a factor loading), the LAMBDAS (λ), which weight each indicator in terms of its centrality to the defined concept. We also incorporate an estimate of the measurement error, DELTAS (δ) for the indicators of the exogenous latent variable and EPISILONS (ϵ) for the indicators of the endogenous latent variable. Unlike conventional applications of multiple regression-path analytic techniques which assume perfect measurement in the independent variables, we have explicitly incorporated measurement error into the measurement model. This ability to incorporate a stochastic term in and of itself justifies the use of these procedures for theoretical orientations that incorporate a fundamental form of indeterminancy. Such indeterminancy in the indicators is incorporated as unique or error variance.

Using these equations it is possible to generate P(P+1)/2 simultaneous equations where P is the total number of indicators. For Figure 2, P = 5 since there are five indicators, namely, X1, X2, X3, Y1, and Y2. We can generate 5(5+1)/2 = 15 equations; more than enough to estimate our twelve unknown coefficients. Thus, by linking the measurement model with the structural model, we are able to accomplish the following: (1) Have our empirical data estimate the true relationship between the defined concepts even though they are unobserved variables--our model contains our theory, (2) Use multiple indicators that allow the defined concepts to have surplus meaning that extends beyond the limited meaning of individual indicators, and (3) Allow our empirical observations to contain measurement error. Each of these capabilities has substantial implications for family theory construction; together they have the potential to revolutionize how we construct and test our theories.

A Detailed Example Applied to Family Theory

So far we have presented an extremely simple illustration which has served to familiarize the reader with the terminology and major ideas. A more complex example will allow us greater appreciation for the potential of this approach to theory construction.

We will again use an heuristic example to illustrate the approach. However, this time we will build on a theory presented in Burr, et al. (1979a) as an example of symbolic interaction applied to family research. Symbolic Interaction is especially useful because it has a strongly subjective component that creates havoc for conventional path analysis procedures. Burr, et al. present symbolic interaction as part of the general body of social science theory rather than focusing on specific

aspects of it that have been used in family theory. This points to the need for three levels of concepts with the highest level linking our ideas to general social science theoretical constructs. Because this is a heuristic example we will take some liberties and take a part of their discussion a bit out of context. Burr, et al. (1979a) utilize work by Goode (1960) concerning the sources of role strain. Kahn, et al. (1964), in a study of conflicts in industries demonstrated that a lack of clarity of expectations contributes to role strain. From this we can induce the theoretical relationship between the the theoretical construct of clarity of role expectations and the theoretical construct, role strain. The fact that Kahn, et al. used defined concepts for these two variables that are relevant to industry suggests that we can utlize defined concepts for them that are relevant to family life. Burr, et al. argue that a lack of clarity of expections about a role in the social group influences the clarity a particular role occupant's experiences. Finally, the clarity of the role from the individual's perspective has a direct effect on role strain. The model in Figure 3 is the same as the model in Burr, et al. Figure 2.8.

--Figure 3 about here--

As is shown in Figure 3, the expectations of the social group have both a direct effect on role strain and an indirect effect acting through the individual's clarity. The individual's clarity has a direct effect on role strain. Figure 4 adapts this model to our approach to theory construction. The variables in Figure 3 appear in Figure 4 as the Theoretical Constructs. Dropping from these we have appended the model for the defined concepts (ellipses) and indicated possible empirical concepts to serve as indicators (rectangles). The three theoretical constructs are high level, abstract,

and unobservable concepts. Some writers call them latent variables since they are never directly observed. Although they are never directly observed, they are meaningful over the full range of social experience. Role clarity is as important to the cocaine user's role as it is to the role of wife-mother. We wish to apply this thinking to the family area and therefore derive family related concepts which represent each of the three theoretical constructs in some family related setting. This is a deductive process and our rules of correspondence need to be elaborated. For clarity of expectations in a social group we will use clarity of expectations of significant other family members regarding the role of wife-mother. We could have just as easily used clarity of the roles for elderly family members, dethroned child role, and so on. All such defined concepts would fit under the more general theoretical construct.

--Figure 4 about here--

We need to have a logical justification that our particular defined concept is an instance of the theoretical construct. Such a rationale for the correspondence between the theoretical construct and defined concept is illustrated by the following:

1. The family is a social group.
2. There are other members of a family who have views on the role of the wife-mother (spouse, children, parents).
3. These people are significant to the occupant of the wife-mother role.
4. Their views may vary in overall consistency and with regard to specific aspects of the wife-mother role.

5. Therefore, the clarity of expectations of significant other family members is a instance of the clarity of expectations in a social group.

This is what is meant by logical rules of correspondence linking theoretical constructs with defined concepts. It is important to justify each statement in this argument.

By a similar process, we need to argue that the clarity of the wife-mother's role expectations is an instance of the clarity of the individual's role expectations, and the wife-mother's role strain is an instance of an individual's role strain. Since each defined concept is an instance of its respective theoretical construct, we can assume that the causal relationships among the defined concepts corresponds to the causal relationships among the theoretical constructs.

The linkage between the defined concepts and the empirical concepts or indicators takes a separate tract. It needs to include both logical and empirical reasoning. Logically, X-1, X-2, and X-3 are meaningful indicators of the clarity of the expectations of significant other family members. X-1 is a consensus score computed to reflect the degree of consensus that significant other members of the family have regarding the wife-mother's role in terms of child care. For some families this may be highly inconsistent, whereas for others it may be highly consistent. Consistency is the source of role clarity. Similarly the consensus of the significant others' views on the wife-mother's sexual expectations and how the housework should be divided provide additional information on the clarity of expectations of significant other family members about the role of wife-mother. It would be possible to include other indicators; another

study might use very different indicators. Still, the defined concept remains role clarity. Thus, while any single study identifies the estimates, the ultimate meaning of the defined concepts rests in the "whole corpus" of research on the subject. People using these techniques for the first time are often confused by the arrows from the defined concepts to the indicators. This is very important since the empirical indicators have their meaning for this theory only as they are reflections of the clarity of expectations of significant others. Any meaning they have apart from the defined concept (and this may be considerable) is unique variance. As Carnap has indicated, the meaning of observables is derived from the part they play in the entire theory within which they are embedded. Empirical indicators do not cause the theory in any sense at all. They are reflections (deductions) of the theory from which we infer the validity of theoretical propositions linking our theoretical terms.

The clarity of the wife-mother's role expectations, ETA-2, is represented by a single indicator. This is not desireable unless there is no measurement error in the indicator. We have done it in this model to illustrate the possibility. Some writers do not show the box for the empirical concept when there is a single indicator because there is no distinction between the empirical concept and the defined concept. This is reasonable with perfect measurement, but it is not reasonable otherwise. It might be possible to estimate the epistemic correlation for a single indicator from other research and, in turn, estimate the error variance. This allows one to use a single indicator as an imperfect measure of the defined concept (see Acock and Scott, 1980).

The wife-mother's role strain has three indicators that are quite different from one another. They were selected on the basis of the discussion in the Burr, et al. presentation of the original model. The galvanic skin response to queries about the wife-mother role would be an excellent indicator of role strain if it could be properly administered and evaluated. It would focus on the role it self, and would minimize various sources of invalid response behavior on the part of the occupant of the role. A general anxiety scale would be an indicator of the wife-mother's role strain although it is not an especially strong one because it is not focused on that role. Presumably, occupants of the role who are under substantial strain will have general anxiety, although there are many other sources of general anxiety. The final indicator, guilt scale for the wife-mother role is more specific and an indicator of role strain that would appear reasonable.

So far, the rules of correspondence justifying the indicators have relied on rational criteria--they are logically and reasonably relevant indicators. However, there are a host of statistical criteria we can use to further evaluate them. First, we need to state our structural equations (this is literal, our theory as it is identified in this application) and our measurement equations. We have two structural equations that represent our theory, namely:

$$\eta_1 = \gamma_{11}\xi + \zeta_1 \qquad 3.1$$

$$\eta_2 = \gamma_{21}\xi + \beta_{21}\eta_1 + \zeta_2 \qquad 3.2$$

We have seven measurement equations, one for each indicator:

$$X_1 = \lambda_1 \xi + \delta_1 \qquad 4.1$$

$$X_2 = \lambda_2 \xi + \delta_2 \qquad 4.2$$

$$X_3 = \lambda_3 \xi + \delta_3 \qquad 4.3$$

$$Y_1 = \lambda_4 \eta_1 + \varepsilon_1 \qquad 4.4$$

$$Y_2 = \lambda_5 \eta_2 + \varepsilon_2 \qquad 4.5$$

$$Y_3 = \lambda_6 \eta_2 + \varepsilon_3 \qquad 4.6$$

$$Y_4 = \lambda_7 \eta_2 \quad \varepsilon_4 \qquad 4.7$$

From the seven measurement equations we can generate $7(7+1)/2 = 26$ estimation equations which are far more equations than we have unknowns. Since our relationships between empirical indicators must go through the defined concepts, any correlations between the indicators must be explained by the theoretical model. Our theory subsumes the empirical correlations so there is no need for empirical propositions. For example, if consensus of significant others on sexual expectations is correlated with general anxiety this must be because consensus on sexual expectations is loaded on clarity of expectations (LAMBDA-2), because clarity of expectations directly causes wife-mother role strain (Gamma 2-1) and indirectly causes it through its effects on clarity of wife-mother's role expectations (GAMMA 1-1 times BETA 2-1), and, finally, general anxiety is loaded on wife-mothers role strain (LAMBDA-6). Similarly, we can examine all of the empirical correlations and determine if they can be explained by the theoretical specification of the model. Each such determination provides a test of the measurement model and of the structural model. Each of these correlations provides an empirical check on our rules of correspondence. Actual output

of the computer program LISREL provides extensive information to evaluate our model both in terms of measurement and in terms of theoretical linkages.

The Payoff

There have been several problems noted for family theory construction that can be resolved by the use of the approach outlined here. Our statistical linkages and empirical propositions have been separated from our theoretical thinking because there has been no effective way to bridge the gap. The application of linear structural equation models bridges this gap. We do not develop empirical propositions. We are not interested in them. Instead, we use statistical relationships between empirical concepts to estimate the true effects in theoretical propositions. This is the most important advance offered by this approach. For the models in Figures 2 and 4, *the theory is represented by the structural and measurement* equations and the coefficients we are estimating for the structural equations are *theoretical* rather than empirical coefficients.

Secondly, we allow for surplus meaning for our theoretical constructs and defined concepts that allows us to move from specific studies to general theories and back again. A researcher could study Figure 4 and decide to compare traditional and modern societies, using several indicators of modernity to reflect the clarity of expectations of significant other family members. This would represent a macro level of analysis using a contextual variable at the level of the nation-state rather than the individual family. Nonetheless, it would bear directly on the identical theory at both the level of defined concepts and the level of theoretical constructs.

A third accomplishment is a more effective approach to measurement. Traditional causal modeling has been heavily informed by the positivist tradition and somewhat estranged from non-positivist perspectives. Symbolic Interactionists and others have shied away from causal modeling because of its assumptions concerning measurement error. For example, all procedures derived from ordinary least squares regression analysis assume that measurement error or unique variance is zero for all independent variables. Since this assumption makes no sense to those who include such theoretical constructs as the "I" or "Id" in their perspectives, causal modeling is seen as extremely limited. In contrast, the perspective suggested here allows us to incorporate measurement models, including realistic assumptions about measurement error, directly into our theory. Is it important to improve our measurement? Christensen (1964) not only indicated that theory construction was critically needed, but also maintained that there "is a strong need to improve the validity and reliability of the data we use (p. 28)." Indeed, the ability to improve measurement and handle measurement error has been central to many of the major advances in science over the last several centuries.

How do these procedures help us deal with measurement error? First, we are able to estimate the error and remove this from our estimates of the coefficients in the structural equations. For example, we indicated that general anxiety might have substantial unique variance because there are many sources of anxiety other than role strain. Still, we would like to utilize the portion of the variance in general anxiety that reflects wife-mother role strain. By removing the error variance we can keep a useful, if limited, indicator and get an unbiased estimate of the structural

coefficients. If we could not remove this unique variance, we would grossly underestimate the true effects of role clarity on role strain. In general, by removing measurement error, we obtain much higher estimates of the coefficients in the structural model. These estimates are not better because they are higher. They are higher because they are better.

There are a large number of technical advantages of the approach to theory construction we have outlined. These include vastly improved ability to deal with longitudinal data, incorporation of correlated errors and common factors to explain error, and the joining together of the full potential of factor analysis with the potential of structural equations. We have only listed these and the interested reader is referred to Bagozzi (1980) and Joreskog and Sorbom (1981). For our present purposes, however, the value of this approach lies in its ability to draw together our theory and our data.

FOOTNOTES

1. It is not intended to be unfair to Goode who has shown an interest in general propositions as well. The point is that the procedures discussed in this paper allow us to bridge the gap between empirical propositions and theoretical propositions.

2. We are not using Zetterberg's syllogistic system for deriving propositions. Syllogisms are not appropriate for concepts that have a stochastic component and, therefore, are rarely relevant to family research.

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Figure 1--Three Levels of Concepts.

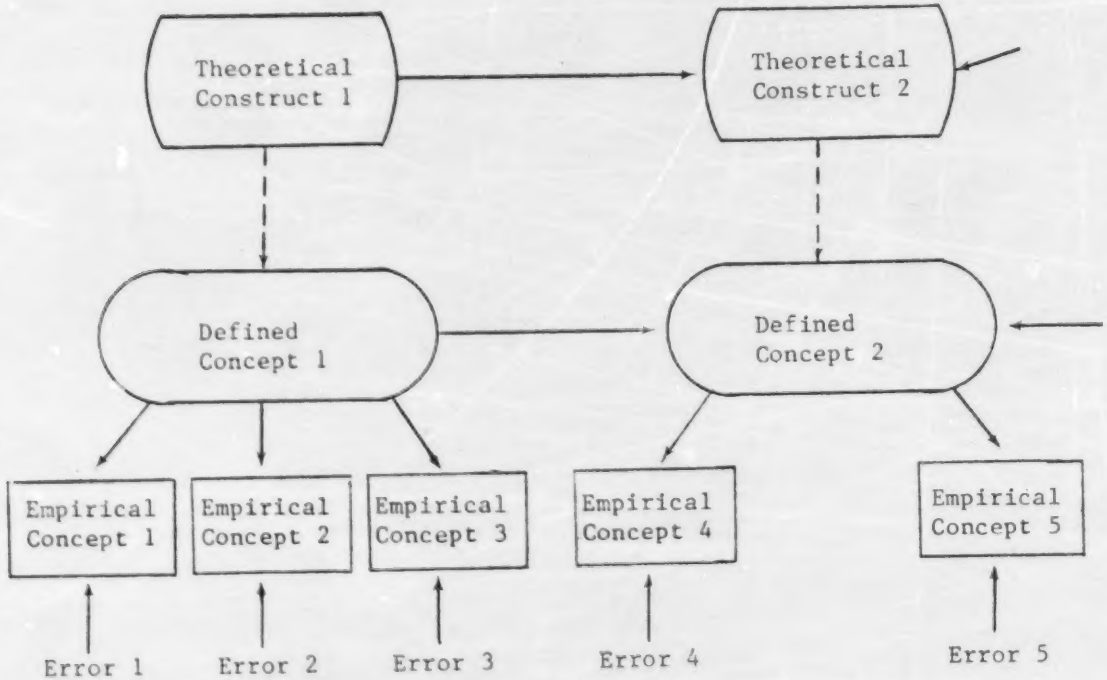

Figure 2--Heuristic Example of Concepts for Figure 1.

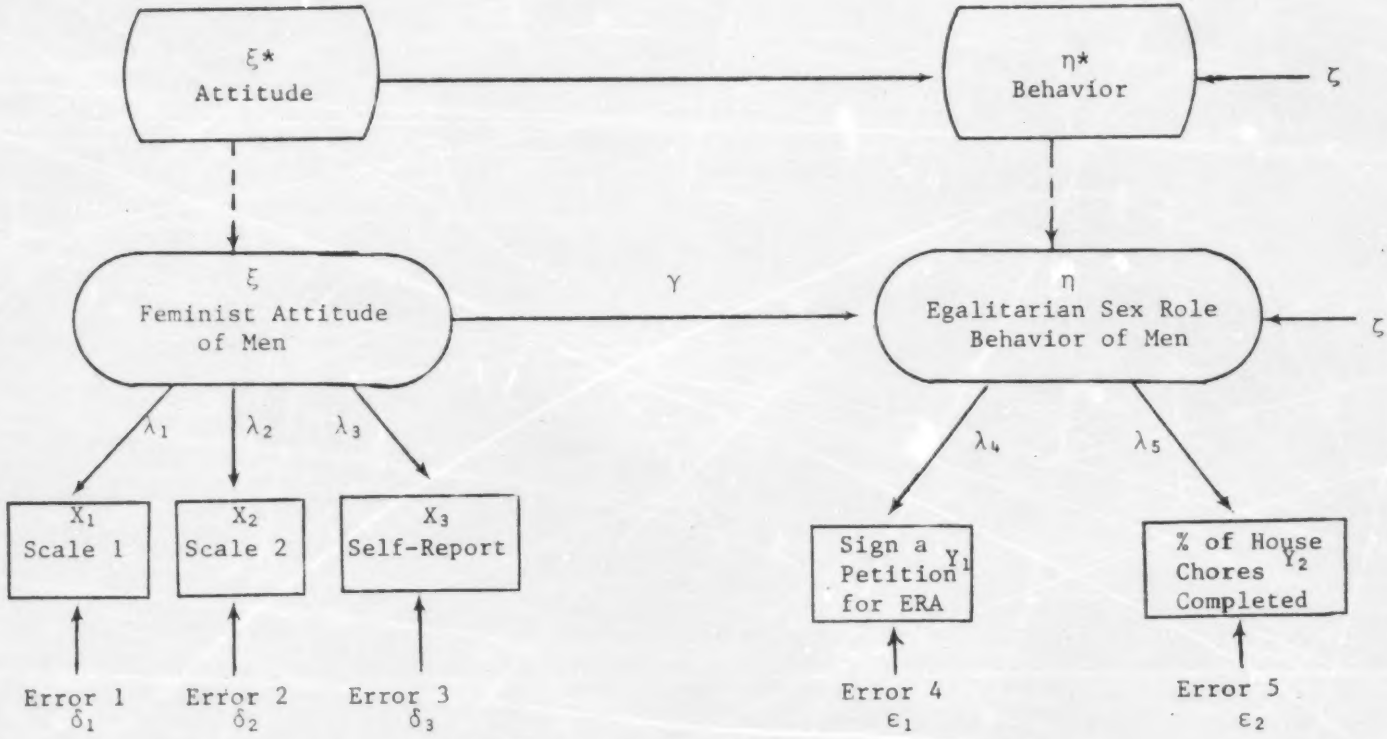

Figure 3. Possible Relationships Between Perceptual and Structural Variable and Role Strain as Shown in Burr, et al. (1979a)

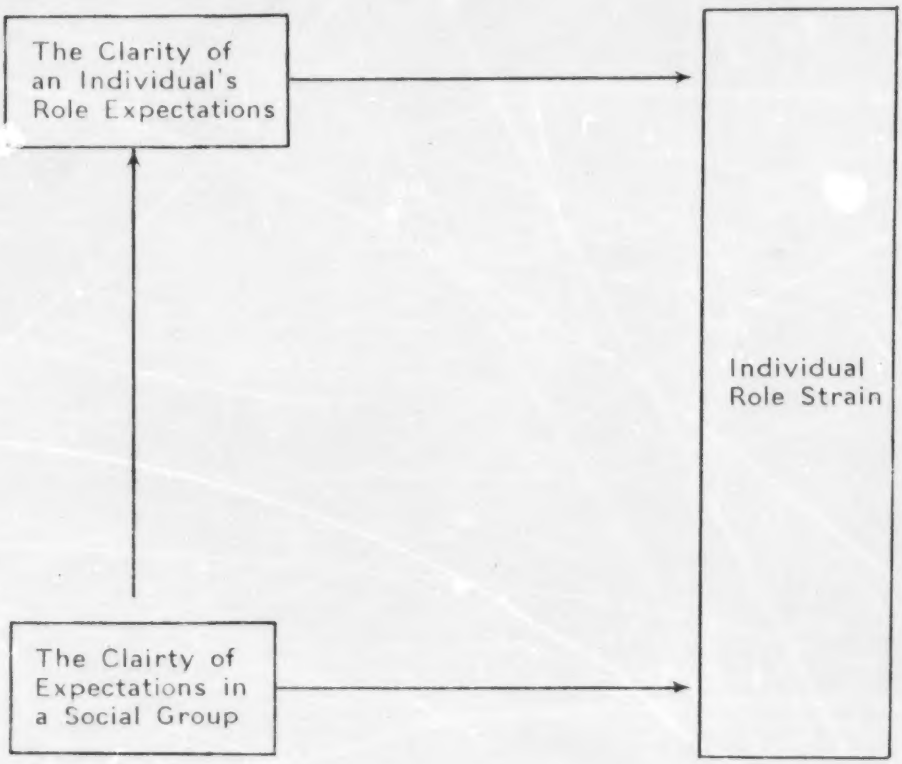

Figure 4--Model of Role Strain Using Three Levels of Concepts.